

Name: _____ Class: ____ Date; _____

Bouncing Ball Efficiency



Learner Outcomes:

-To practice the calculation of and the factors that affect efficiency.

Key Terms:

Efficiency

Input

Output

Background Information:

The purpose of using a mechanical device is to make our lives easier. That means, we want a device that is more efficient. In other words, we want a device that gives us more output work or motion relative to the energy we put into it.

Research Question: How energy-efficient are various types of balls when bounced off a hard floor?

Materials:

Variety of bouncy balls

Ruler

Procedure:

1. Hold a metre stick upright against the floor. Hold one of the balls above the floor so that the bottom of the ball is exactly 100cm above the floor. Drop the ball. Have your partner observe the height to which the bottom of the ball bounces on the first bounce. This is called the ball's **rebound height**. Record the measurement on your lab sheet.
2. Drop that same ball 2 more times and calculate the **average rebound height** by adding all 3 measurements and divide by 3. Record the average in your table.

$$\text{Average Rebound Height} = \frac{(\text{Height 1} + \text{Height 2} + \text{Height 3})}{3}$$

3. Repeat steps one and two for each type of ball.
4. Calculate the efficiency of each ball.

$$\text{Efficiency} = \frac{\text{average rebound height}}{\text{starting height}} \times 100\%$$

Observations:

Type of Ball	Starting Height (cm)	Rebound Heights (cm)			Average Rebound Height (cm)	Efficiency
	100					
	100					
	100					
	100					
	100					
	100					
	100					

Analysis:

1. According to your calculations, list the balls from most efficient to least efficient.

2. What percentage of energy was lost for the least efficient ball?

3. Where do you think the "wasted" or "lost" energy went?

4. What was the input energy?

5. Which balls could you make more efficient? How would you do that?

6. Besides the type of ball that was used, what other factors can determine how efficient the ball is?

Extension:

1. How would you calculate the efficiency of a bicycle or other complex machine? Choose a machine and design an experiment to determine the efficiency of that device. Besides efficiency, what other criteria would you use to evaluate the mechanical device you chose?